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ABSTRACT

On the basis of information available to them in April 1973, representatives for the Higher Education Panel at 209 institutions gave estimates of the number of doctorates that would be awarded within each field of study during the academic years of July 1972-June 1973 and July 1974-June 1975. The figures reported afford a picture of the possible impact of the collective expectations. In general, doctorate production is expected to increase moderately, and most fields of study will have a share in this increased output. Only in physical sciences did representatives expect to see a somewhat lowered rate of doctoral output by 1975. If their estimates prove reliable, the relative proportion of doctorates contributed by each field of study will remain fairly stable. Only minor shifts will occur in the relative proportion of degrees granted in a given field of study by public and private institutions or by top 20, developing, or other institutions. Tabulated data are included to support the predictions. (Author/LBH)

Higher Education Panel

Report

American Council on Education

Survey No. 16

April 1974

Production of Doctorates in Selected Fields, 1972-1975

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Recent developments in the higher education community related to governmental and nongovernmental policy, changes in student aspirations, and changes in manpower and employment demand have created a need for current data on graduate enrollments and degree projections. The Higher Education Panel initiated this survey in order to provide indicators of the impact of recent institutional policy changes on Ph.D. production levels and to gain better baseline data for projecting trends in the availability of professionals in specified fields.

The questionnaire (see Appendix A) was mailed on April 3, 1973 to a sample of 219 institutions, out of a population of 314 Ph.D.-granting institutions. Each respondent was asked, first, to indicate the number of doctorate degrees the institution had conferred in each field between July 1971 and June 1972 and, secondly, to estimate the number it expected to confer in each field during two other years, July 1972-June 1973 and July 1974-June 1975 (see Appendix B for the definitions of major fields of study). For the purposes of this survey

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the doctoral classification included Ph.D., Sc.D., D.P.H., and Ed.D. degrees but excluded professional degrees such as the M.D., D.D.S., and D.V.M. degrees.

Completed questionnaires were received from 209 institutions for a response rate of 95.4 percent. Data provided by these sample institutions were statistically weighted in order to provide estimates of the number of doctorates that would be awarded at all Ph.D.-granting institutions during the three time periods. (See Appendix C for a description of sampling and weighting procedures.) The weighted figures shown here represent approximations to what would have been reported by the full population of Ph.D.-granting institutions; they are not, however, based on exact counts. Thus, for instance, the estimate reported here for the number of doctorates awarded in 1971-1972 is 33,729. In comparison, the figure reported by the National Research Council for 1971-1972 was 33,001.[1] It should be be noted, however, that U.S. Office of Education figures on earned degrees have typically been somewhat higher than NRC figures. For 1970-1971, the USOE figures for the total number of degrees awarded was 32,113 whereas the total reported by the National Research Council was 31,772.[2]

All figures for 1972-1973 and 1974-1975 are based on institutional projections or estimates. No assumptions were provided to the institutional representatives completing the questionnaire. Projections were to be based on their assessment of the impact of recent developments and the unique effect these developments have had or were anticipated to have on their institutions. The representatives who provided the estimates included a variety of institutional officers, including graduate and academic deans, directors of institutional planning or institutional research, and administrative vice-presidents.

Because they do not cover an extended period, the estimates given by institutional representatives for 1972-1973 and 1974-1975 were probably based on

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[1] National Research Council, Doctorate Recipients From United States Universities, Summary Report, 1972. Washington, D. C.: National Research Council, May 1973.

[2] United States Office of Education, Earned Degrees Conferred, 1970-1971, Washington, D.C.: Government Printing Office, 1973.

information about actual enrollments, known support levels, and budgets either existing or projected with some degree of certainty. Nevertheless, individual projections are likely to vary somewhat from the actual number of degrees conferred during these years. Similarly, the figures presented in this report are aggregated estimates that will not equal the number of degrees actually conferred during 1972-1973 or 1974-1975. As an indication, unpublished data from the 1972-1973 NRC Survey of Earned Doctorates show a figure of 33,727 doctorates awarded in 1972-1973, a two percent increase over the total number awarded in 1971-1972.[3] In comparison, the figure reported here on the basis of institutional estimates was higher; the estimate was that 35,532 doctorate degrees would be conferred. The projections for 1974-1975 could be subject to similar variation from actual figures.

Discussion

The results of this survey (reported in Tables 1-11) indicate that the total number of doctorate degrees to be conferred are expected to increase moderately at least through the 1974-1975 academic year. Total doctorate production, based on current enrollments and the best judgment of the institutional representatives, was projected for 1974-1975 to increase by approximately eight and one-half percent above the reported production level of 1971-1972. This increase was anticipated in both public and private institutions, with the rate of growth in total doctorate production relatively equal in both sectors.

Table 1 presents percentage change data by field of study, institutional control (public, private) and year. For most fields of study, institutional representatives expected doctorate production to increase moderately over the

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[3]Data for 1972-1973 were obtained from Doctorate Record Files, Commission on Human Resources, National Research Council, Washington, D. C.

three-year period. The largest increases were expected in the health professions (24.2 percent) and in the "other fields" category (16.0 percent). In contrast, the only anticipated decrease (2.6 percent) was in physical sciences, while the number of engineering doctorates awarded each year was expected to remain about the same.

Total doctorate production for the 1974-1975 academic year was expected to increase by approximately the same rate within public and private institutions. However, specific fields of study tended to show a disproportionate rate of increase in favor of one sector of the population. With engineering, for example, institutional representatives at public institutions expected the number of doctorates awarded to increase 3.5 percent by 1974-1975, whereas representatives at private institutions expected the number of doctorates in engineering to decrease 3.5 percent by that year. Similarly, substantial gains were expected for the arts and humanities, mathematical sciences, and "all other fields" in the public sector (14.0 percent, 16.3 percent, and 19.9 percent, respectively) while only moderate gains or losses were expected for these fields in the private sector (7.3 percent, -2.8 percent, and 7.9 percent, respectively). In contrast, the life sciences and social sciences reported sizeable gains in the private sector (19.1 percent and 15.7 percent) and only moderate gains in the public sector (8.5 percent and 6.8 percent). One field, health professions, was expected to increase considerably in both sectors although the largest increase was expected at public institutions.

Tables 2-6 are refinements of Table 1. The estimated number of doctorates to be awarded and the numerical and percentage change in doctorate production by field and year for all institutions and for public and private institutions are shown in Tables 2 through 4. Percentage distributions by field (Table 5) and by institutional control (Table 6) are presented separately.

Although noticeable increases are projected in a number of fields of study for both public and private institutions, the proportions of each year's total doctorate production attributable to each field of study were expected to remain fairly constant (Table 5). Over the three time periods covered by the survey, only minor changes are detected in the proportion of the total doctorates to be conferred in each field. Thus, for example, 15.6 percent of the doctorates awarded in the 1971-1972 academic year were granted in the arts and humanities while the corresponding percentage for 1974-1975 is 15.9 percent. Although this difference is relatively small, it is not atypical of the differences noted for the other fields of study. Table 5 presents similar data for all fields, time periods, and types of institutions dealt with thus far.

This consistency also holds true when controlling for type of institution. As can be noted in Table 6, the proportion of doctorates in each field that would be awarded by public and by private institutions is expected to remain stable across the three points in time. Although there are minor variations, no significant differences are expected.

Tables 7-9 report doctorate production estimates by field of study, academic year and by type of institution. Reference is made in the tables to "top twenty" and "developing" institutions. The "top twenty" were designated on the basis of National Science Foundation Fellows most frequently selecting these institutions for graduate study and on the basis of the largest amounts of Federal research and development money awarded. These twenty institutions accounted for almost 30 percent of all doctorates awarded in science and engineering in 1971-1972 (Table 11).[4] "Developing" institutions are those which awarded science or engineering doctorates for the first time in 1960 or later. They accounted for

[4]Science and engineering as used here refer to the following major fields as listed on the survey instrument in Appendix B: engineering, life sciences, mathematical sciences, physical sciences, and social sciences.

about 7 percent of all science and engineering doctorates in 1971-1972.

The "top twenty" institutions were estimated to show little overall change between 1971-1972 and 1974-1975 in levels of doctorate production, although some changes among specific fields were expected. Decreases were anticipated in engineering, mathematical sciences, and physical sciences. The expected losses in these fields contrast with the large expected gain in the health professions.

From Tables 8 and 9, it can be seen that both "developing" and "all other" institutions were expected to increase their doctorate production in the 1974-1975 academic year by a greater percentage than the national average, with "developing" institutions increasing by 38.9 percent. In "developing" institutions, often sizeable gains were expected for particular fields of study; it should be noted, however, that these percentage increases are partially an artifact of the small base Ns for these fields. The "developing" institutions were expected to grant only 9.5 percent of the total number of doctorate degrees in 1974-1975 (Table 11).

Summary

On the basis of information available to them in April of 1973, representatives for the Higher Education Panel at 209 institutions gave estimates of the number of doctorates that would be awarded within each field of study during the academic years of July 1972-June 1973 and July 1974-June 1975. The figures reported here afford a picture of the possible impact of their collective expectations. In brief, doctorate production is expected to increase moderately, and most fields of study will have a share in this increased output. Only in physical sciences did representatives expect to see a somewhat lowered rate of doctoral output by 1975. If their estimates prove to be reliable, the relative proportion of doctorates contributed by each field of study will remain fairly stable (Table 10). Similarly, only minor shifts will occur in the relative proportion of degrees granted in a given field of study by public and private institutions (Table 6) or by top twenty, developing, or other institutions (Table 11).

Table 1

Anticipated Change in the Production of Doctorates by Field, Year, and Type of Institution

Field of Study	Anticipated Percentage Change from 1971-1972 to:					
	1972-1973			1974-1975		
	All Inst.	All Public	All Private	All Inst.	All Public	All Private
TOTAL	5.3	4.4	7.1	8.6	8.9	8.1
Arts and Humanities	8.2	9.5	6.8	10.8	14.0	7.3
Education	9.1	7.9	13.2	11.4	10.5	14.2
Engineering	1.4	.8	2.6	.7	3.5	-3.5
Health Professions	8.7	15.6	-4.4	24.2	29.9	14.1
Life Sciences	7.0	3.9	17.7	10.9	8.5	19.1
Biology	26.4	21.4	32.3	35.1	42.0	24.4
Biochemistry	-5.1	-3.7	-8.9	7.9	9.2	4.8
Microbiology	18.7	19.2	17.0	32.0	30.1	36.2
Physiology	22.6	9.6	50.5	8.3	.4	24.8
Other life sciences	.5	-.6	8.7	2.6	.5	15.3
Mathematical Sciences	-1.8	2.9	-9.2	9.0	16.3	-2.8
Physical Sciences	-1.1	-3.8	3.8	-2.6	-3.8	-.4
Chemistry	.2	-5.4	11.1	-2.6	-5.9	4.1
Physics	.7	-2.5	5.3	-4.4	-6.5	-1.5
Other physical sciences	-6.2	-2.3	-16.1	- .3	3.0	-8.6
Social Sciences	4.4	1.4	9.5	10.1	6.8	15.7
Economics	1.7	1.9	1.2	5.3	6.7	3.0
Psychology	11.0	4.1	27.4	20.3	9.4	45.7
Sociology	-6.1	-3.1	-10.0	6.9	13.4	-1.9
Other social sciences	3.1	-.6	8.5	3.5	1.2	7.1
All Other Fields	8.1	8.9	6.2	16.0	19.9	7.9
Subtotal Science/Engineering	2.8	1.0	6.3	5.6	5.1	6.6

Table 2
Production of Doctorates in Selected Fields, 1972-1975
All Institutions
[N-314]

Field of Study	Doctorates Conferred			Anticipated Change From 1971-1972 to:			
	Estimated			1972-1973		1974-1975	
	1971-1972	1972-1973	1974-1975	Number	Percent	Number	Percent
TOTAL	33,729	35,532	36,626	1,803	5.3	2,897	8.6
Arts and Humanities	5,252	5,685	5,818	433	8.2	566	10.8
Education	6,852	7,477	7,632	625	9.1	780	11.4
Engineering	3,649	3,702	3,675	53	1.4	26	.7
Health Professions	796	865	989	69	8.7	193	24.2
Life Sciences	4,502	4,815	4,991	313	7.0	489	10.9
Biology	669	846	904	177	26.4	235	35.1
Biochemistry	494	469	533	- 25	- 5.1	39	7.9
Microbiology	369	438	487	69	18.7	118	32.0
Physiology	349	428	378	79	22.6	29	8.3
Other life sciences	2,621	2,634	2,689	13	0.5	68	2.6
Mathematical Sciences	1,417	1,392	1,544	- 25	- 1.8	127	9.0
Physical Sciences	4,178	4,132	4,068	- 46	- 1.1	- 110	- 2.6
Chemistry	1,871	1,875	1,823	4	.2	- 48	- 2.6
Physics	1,334	1,344	1,275	10	.7	- 59	- 4.4
Other physical sciences	973	913	970	- 60	- 6.2	- 3	- .3
Social Sciences	5,217	5,447	5,744	230	4.4	527	10.1
Economics	1,052	1,070	1,108	18	1.7	56	5.3
Psychology	1,806	2,005	2,172	199	11.0	366	20.3
Sociology	652	612	697	- 40	- 6.1	45	6.9
Other social sciences	1,707	1,760	1,767	53	3.1	60	3.5
All Other Fields	1,866	2,017	2,165	151	8.1	299	16.0
Subtotal Science/Engineering	18,963	19,488	20,022	525	2.8	1,059	5.6

Table 3
Production of Doctorates in Selected Fields, 1972-1975
Public Institutions
(N=168)

Field of Study	Doctorates Conferred			Anticipated Change From 1971-1972 to:			
	Estimated			1972-1973		1974-1975	
	1971-1972	1972-1973	1974-1975	Number	Percent	Number	Percent
TOTAL	22,354	23,347	24,335	993	4.4	1,981	8.9
Arts and Humanities	2,734	2,995	3,117	261	9.5	383	14.0
Education	5,256	5,671	5,810	415	7.9	554	10.5
Engineering	2,212	2,230	2,289	18	.8	77	3.5
Health Professions	525	607	682	82	15.6	157	29.9
Life Sciences	3,494	3,630	3,791	136	3.9	297	8.5
Biology	402	488	571	86	21.4	169	42.0
Biochemistry	348	335	380	- 13	- 3.7	32	9.2
Microbiology	276	329	359	53	19.2	83	30.1
Physiology	239	262	240	23	9.6	1	.4
Other life sciences	2,229	2,216	2,241	- 13	- .6	12	.5
Mathematical Sciences	873	898	1,015	25	2.9	142	16.3
Physical Sciences	2,716	2,614	2,612	- 102	- 3.8	- 104	- 3.8
Chemistry	1,233	1,167	1,160	- 66	- 5.4	- 73	- 5.9
Physics	794	774	742	- 20	- 2.5	- 52	- 6.5
Other physical sciences	689	673	710	- 16	- 2.3	21	3.0
Social Sciences	3,288	3,334	3,513	46	1.4	225	6.8
Economics	624	636	666	12	1.9	42	6.7
Psychology	1,271	1,323	1,391	52	4.1	120	9.4
Sociology	381	369	432	- 12	- 3.1	51	13.4
Other social sciences	1,012	1,006	1,024	- 6	- .6	12	1.2
All Other Fields	1,256	1,368	1,506	112	8.9	250	19.9
Subtotal Science/Engineering	12,583	12,706	13,220	123	1.0	637	5.1

Table 4
Production of Doctorates in Selected Fields, 1972-1975

Private Institutions
(N=146)

Field of Study	Doctorates Conferred			Anticipated Change From 1971-1972 to:			
	Estimated			1972-1973		1974-1975	
	1971-1972	1972-1973	1974-1975	Number	Percent	Number	Percent
TOTAL	11,374	12,186	12,293	812	7.1	919	8.1
Arts and Humanities	2,518	2,690	2,701	172	6.8	183	7.3
Education	1,596	1,806	1,822	210	13.2	226	14.2
Engineering	1,436	1,473	1,386	37	2.6	- 50	- 3.5
Health Professions	270	258	308	- 12	- 4.4	38	14.1
Life Sciences	1,008	1,186	1,201	178	17.7	193	19.1
Biology	266	352	331	86	32.3	65	24.4
Biochemistry	146	133	153	- 13	- 8.9	7	4.8
Microbiology	94	110	128	16	17.0	34	36.2
Physiology	109	164	136	55	50.5	27	24.8
Other life sciences	393	427	453	34	8.7	60	15.3
Mathematical Sciences	544	494	529	- 50	- 9.2	- 15	- 2.8
Physical Sciences	1,462	1,517	1,456	55	3.8	- 6	- .4
Chemistry	637	708	663	71	11.1	26	4.1
Physics	545	574	537	29	5.3	- 8	- 1.5
Other physical sciences	280	235	256	- 45	-16.1	- 24	- 8.6
Social Sciences	1,929	2,113	2,231	184	9.5	302	15.7
Economics	428	433	441	5	1.2	13	3.0
Psychology	536	683	781	147	27.4	245	45.7
Sociology	270	243	265	- 27	-10.0	- 5	- 1.9
Other social sciences	695	754	744	59	8.5	49	7.1
All Other Fields	611	649	659	38	6.2	48	7.9
Subtotal Science/Engineering	6,379	6,783	6,803	404	6.3	424	6.6

Table 5

Percentage Distribution of Doctorates by Field, 1972-1975

All Institutions
Public Institutions
Private Institutions

Field of Study	All Institutions			Public Institutions			Private Institutions		
	Estimated			Estimated			Estimated		
	1971-72	1972-73	1974-75	1971-72	1972-73	1974-75	1971-72	1972-73	1974-75
TOTAL									
Arts and Humanities	15.6	16.0	15.9	12.2	12.8	12.8	22.1	22.1	21.8
Education	20.3	21.0	20.8	23.5	24.3	23.9	14.0	14.8	14.8
Engineering	10.8	10.4	10.0	9.9	9.6	9.4	12.6	12.1	11.3
Health Professions	2.4	2.4	2.7	2.3	2.6	2.8	2.4	2.1	2.5
Life Sciences	13.3	13.5	13.6	15.6	15.5	15.6	8.8	9.7	9.8
Biology	2.0	2.4	2.5	1.8	2.1	2.3	2.3	2.9	2.7
Biochemistry	1.5	1.3	1.5	1.6	1.4	1.5	1.3	1.1	1.2
Microbiology	1.1	1.2	1.3	1.2	1.4	1.5	.8	.9	1.0
Physiology	1.0	1.2	1.0	1.1	1.1	.9	.9	1.3	1.1
Other life sciences	7.8	7.4	7.3	10.0	9.5	9.2	3.5	3.5	3.7
Mathematical Sciences	4.2	3.9	4.2	4.0	3.8	4.2	4.8	4.0	4.3
Physical Sciences	12.4	11.6	11.1	12.1	11.2	10.7	12.8	12.4	11.8
Chemistry	5.5	5.3	5.0	5.5	5.0	4.8	5.6	5.8	5.4
Physics	4.0	3.8	3.5	3.5	3.3	3.0	4.8	4.7	4.4
Other physical sciences	2.9	2.6	2.6	3.1	2.9	2.9	2.5	1.9	2.1
Social Sciences	15.4	15.3	15.7	14.7	14.3	14.4	16.9	17.3	18.1
Economics	3.1	3.0	3.0	2.8	2.7	2.7	3.8	3.5	3.6
Psychology	5.3	5.6	5.9	5.7	5.7	5.7	4.7	5.6	6.4
Sociology	1.9	1.7	1.9	1.7	1.6	1.8	2.4	2.0	2.2
Other social sciences	5.1	4.9	4.8	4.5	4.3	4.2	6.1	6.2	6.1
All Other Fields	5.5	5.8	5.9	5.6	5.8	6.2	5.4	5.3	5.4
Subtotal Science/Engineering	56.2	54.8	54.7	56.3	54.4	54.3	56.1	55.6	55.3

Table 6

Percentage Distribution of Doctorates by Type of Institution, 1972 - 1975

Public Institutions

Private Institutions

Field of Study	Public Institutions			Private Institutions		
	1971-72	1972-73	1974-75	1971-72	1972-73	1974-75
TOTAL	66.3	65.7	66.4	33.7	34.3	33.6
Arts and Humanities	52.0	52.7	53.6	47.9	47.3	46.4
Education	76.7	75.8	76.1	23.3	24.2	23.9
Engineering	60.6	60.2	62.3	39.4	39.8	37.7
Health Professions	66.6	70.2	68.9	33.9	29.8	31.1
Life Sciences	77.6	75.4	75.9	22.4	24.6	24.1
Biology	60.0	58.1	63.3	39.8	41.9	36.7
Biochemistry	70.4	71.6	71.3	29.6	28.4	28.7
Microbiology	74.8	75.0	73.7	25.5	25.0	26.3
Physiology	68.5	61.5	63.8	31.2	38.5	36.2
Other life sciences	85.0	83.8	83.2	15.0	16.2	16.8
Mathematical Sciences	61.6	64.5	65.7	38.4	35.5	34.3
Physical Sciences	65.0	63.3	64.2	35.0	36.7	35.8
Chemistry	65.9	62.2	63.6	34.0	37.8	36.4
Physics	59.5	57.4	58.0	40.8	42.6	42.0
Other physical sciences	70.8	74.1	73.5	28.8	25.9	26.5
Social Sciences	63.0	61.2	61.2	37.0	38.8	38.8
Economics	59.3	59.5	60.2	40.7	40.5	39.8
Psychology	70.3	66.0	64.0	29.7	34.0	36.0
Sociology	58.4	60.3	62.0	41.5	39.7	38.0
Other Social Sciences	59.3	57.2	57.9	40.7	42.8	42.1
All Other Fields	67.3	67.8	69.6	32.7	32.2	30.4
Subtotal Science/Engineering	66.4	65.2	66.0	33.6	34.8	34.0

Table 7
Production of Doctorates in Selected Fields, 1972-1975

"Top Twenty" Institutions
(N=20)

Field of Study	Doctorates Conferred			Anticipated Change From 1971-1972 to:			
	Estimated			1972-1973		1974-1975	
	1971-1972	1972-1973	1974-1975	Number	Percent	Number	Percent
TOTAL	8,904	9,090	8,853	186	2.1	- 51	- .6
Arts and Humanities	1,850	1,902	1,865	52	2.8	15	.8
Education	864	969	910	105	12.2	46	5.3
Engineering	1,267	1,251	1,171	- 16	- 1.3	- 96	- 7.6
Health Professions	164	203	235	39	23.8	71	43.3
Life Sciences	1,018	1,076	1,019	58	5.7	1	.1
Biology	126	169	134	43	34.1	8	6.3
Biochemistry	120	90	108	- 30	-25.0	- 12	-10.0
Microbiology	62	71	75	9	14.5	13	21.0
Physiology	72	78	83	6	8.3	11	15.3
Other life sciences	638	668	619	30	4.7	- 19	- 3.0
Mathematical Sciences	438	387	381	- 51	-11.6	- 57	-13.0
Physical Sciences	1,320	1,238	1,207	- 82	- 6.2	-113	- 8.6
Chemistry	507	500	464	- 7	- 1.4	- 43	- 8.5
Physics	474	468	473	- 6	- 1.3	- 1	- .2
Other physical sciences	339	270	270	- 69	-20.4	- 69	-20.4
Social Sciences	1,597	1,630	1,653	33	2.1	56	3.5
Economics	382	386	388	4	1.0	6	1.6
Psychology	288	318	326	30	10.4	38	13.2
Sociology	210	204	215	- 6	- 2.8	5	2.4
Other social sciences	717	722	724	5	.7	7	1.0
All Other Fields	386	434	412	48	12.4	26	6.7
Subtotal Science/Engineering	5,640	5,582	5,431	- 58	- 1.0	-209	- 3.7

Table 8.
Production of Doctorates in Selected Fields, 1972-1975
"Developing" Institutions
(N=65)

Field of Study	Doctorates Conferred			Anticipated Change From 1971-1972 to:			
	Estimated			1972-1973		1974-1975	
	1971-1972	1972-1973	1974-1975	Number	Percent	Number	Percent
TOTAL	2,505	2,867	3,479	362	14.5	974	38.9
Arts and Humanities	290	319	417	29	10.0	127	43.8
Education	626	726	784	100	16.0	158	25.2
Engineering	209	249	301	40	19.1	92	44.0
Health Professions	165	170	185	5	3.0	20	12.1
Life Sciences	283	368	437	85	30.0	154	54.4
Biology	122	185	214	63	51.6	92	75.4
Biochemistry	25	18	30	- 7	-28.0	5	20.0
Microbiology	12	18	27	6	50.0	15	125.0
Physiology	11	9	16	- 2	-18.2	5	45.4
Other life sciences	113	138	150	25	22.1	37	32.7
Mathematical Sciences	85	104	175	19	22.4	90	105.9
Physical Sciences	378	392	436	14	3.7	58	15.3
Chemistry	198	226	249	28	14.1	51	25.8
Physics	110	108	116	- 2	- 1.8	6	5.5
Other physical sciences	70	58	71	- 12	-17.1	1	1.4
Social Sciences	392	456	617	64	16.3	225	57.4
Economics	51	45	63	- 6	-11.8	12	23.5
Psychology	214	274	370	60	28.0	156	72.9
Sociology	30	40	66	10	33.3	36	120.0
Other social sciences	97	97	118	0	0	21	21.6
All Other Fields	77	83	127	6	7.8	50	64.9
Subtotal Science/Engineering	1,347	1,569	1,966	222	16.5	619	46.0

Table 9
Production of Doctorates in Selected Fields, 1972-1975
"All Other" Institutions
(N=229)

Field of Study	Doctorates Conferred			Anticipated Change From 1971-1972 to:			
	Estimated			1972-1973		1974-1975	
	1971-1972	1972-1973	1974-1975	Number	Percent	Number	Percent
TOTAL	22,323	23,524	24,191	1,201	5.4	1,868	8.4
Arts and Humanities	3,129	3,474	3,546	345	11.0	417	13.3
Education	5,340	5,746	5,876	406	7.6	536	10.0
Engineering	2,177	2,205	2,213	28	1.3	36	1.7
Health Professions	467	484	560	17	3.6	93	19.9
Life Sciences	3,208	3,407	3,527	199	6.2	319	9.9
Biology	420	494	542	74	17.6	122	29.0
Biochemistry	360	371	407	11	3.1	47	13.1
Microbiology	287	336	360	49	17.1	73	25.4
Physiology	268	348	277	80	29.9	9	3.4
Other life sciences	1,873	1,858	1,941	- 15	- 0.8	68	3.6
Mathematical Sciences	893	909	999	16	1.8	106	11.9
Physical Sciences	2,483	2,482	2,392	- 1	0	- 91	- 3.7
Chemistry	1,256	1,184	1,142	- 72	- 5.7	- 114	- 9.1
Physics	812	799	724	- 13	- 1.6	- 88	-10.8
Other physical sciences	415	499	526	84	20.2	111	26.7
Social Sciences	3,253	3,384	3,526	131	4.0	273	8.4
Economics	610	647	660	37	6.1	50	8.2
Psychology	1,335	1,415	1,502	80	6.0	167	12.5
Sociology	417	370	422	- 47	-11.3	5	1.2
Other social sciences	891	952	942	61	6.8	51	5.7
All Other Fields	1,373	1,433	1,552	60	4.4	179	13.0
Subtotal Science/Engineering	12,014	12,387	12,657	373	3.1	643	5.4

Table 10
Percentage Distribution of Doctorates by Field, 1971-1975

"Top Twenty" Institutions
"Developing" Institutions
"All Other" Institutions

Field of Study	Top Twenty Institutions			Developing Institutions			All Other Institutions		
	Actual	Estimated		Actual	Estimated		Actual	Estimated	
	1971-72	1972-73	1974-75	1971-72	1972-73	1974-75	1971-72	1972-73	1974-75
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Arts and Humanities	20.8	20.9	21.1	11.6	11.1	12.0	14.0	14.8	14.7
Education	9.7	10.7	10.3	24.9	25.3	22.5	23.9	24.4	24.3
Engineering	14.2	13.8	13.2	8.3	8.7	8.6	9.7	9.4	9.1
Health Professions	1.8	2.2	2.6	6.6	5.9	5.3	2.1	2.1	2.3
Life Sciences	11.4	11.8	11.5	11.3	12.8	12.6	14.4	14.5	14.6
Biology	1.4	1.9	1.5	4.9	6.4	6.1	1.9	2.1	2.2
Biochemistry	1.3	1.0	1.2	1.0	.6	.9	1.6	1.6	1.7
Microbiology	.7	.8	.8	.5	.6	.8	1.3	1.4	1.5
Physiology	.8	.9	.9	.4	.3	.5	1.2	1.5	1.1
Other life sciences	7.2	7.3	7.0	4.5	4.8	4.3	8.4	7.9	8.0
Mathematical Sciences	4.9	4.2	4.3	3.4	3.6	5.0	4.0	3.9	4.1
Physical Sciences	14.8	13.6	13.6	15.1	13.7	12.5	11.1	10.6	10.0
Chemistry	5.7	5.5	5.2	7.9	7.9	7.1	5.6	5.0	4.7
Physics	5.3	5.2	5.3	4.4	3.8	3.3	3.6	3.4	3.0
Other physical sciences	3.8	3.0	3.0	2.8	2.0	2.0	1.9	2.1	2.2
Social Sciences	17.9	17.9	18.7	15.6	15.9	17.7	14.6	14.4	14.6
Economics	4.3	4.2	4.4	2.0	1.6	1.8	2.7	2.7	2.7
Psychology	3.2	3.5	3.7	8.5	10.0	10.6	6.0	6.0	6.2
Sociology	2.3	2.2	2.4	1.2	1.4	1.9	1.9	1.6	1.7
Other social sciences	8.0	7.9	8.2	3.9	3.4	3.4	4.0	4.0	3.9
All Other Fields	4.3	4.8	4.6	3.1	2.9	3.6	6.1	6.1	6.4
Subtotal Science/Engineering	63.3	61.4	61.3	53.8	54.7	56.5	53.8	52.7	52.3

Table 11

Percentage Distribution of Doctorates by Type of Institution, 1972-1975
"Top Twenty" Institutions
"Developing" Institutions
"All Other" Institutions

Field of Study	Top Twenty Institutions			Developing Institutions			All Other Institutions		
	71-72	72-73	74-75	71-72	72-73	74-75	71-72	72-73	74-75
TOTAL	26.4	25.6	24.3	7.4	8.1	9.5	66.2	66.3	66.2
Arts and Humanities	35.1	33.4	32.0	5.5	5.6	7.2	59.4	61.0	60.8
Education	12.6	13.0	12.0	9.2	9.8	10.4	78.2	77.2	77.6
Engineering	34.7	33.8	31.8	5.7	6.7	8.2	59.6	59.5	60.0
Health Professions	20.6	23.7	24.0	20.7	19.8	18.9	58.7	56.5	57.1
Life Sciences	22.6	22.2	20.4	6.3	7.6	8.8	71.1	70.2	70.8
Biology	18.8	19.9	15.1	18.3	21.8	24.0	62.9	58.3	60.9
Biochemistry	23.8	18.8	19.8	4.9	3.8	5.5	71.3	77.4	74.7
Microbiology	17.2	16.7	16.2	3.3	4.2	5.9	79.5	79.1	77.9
Physiology	20.5	17.9	22.1	3.1	2.1	4.2	76.4	80.0	73.7
Other life sciences	24.3	25.1	22.9	4.3	5.2	5.5	71.4	69.7	71.6
Mathematical Sciences	30.9	27.7	24.5	6.0	7.4	11.3	63.1	64.9	64.2
Physical Sciences	31.6	30.1	29.9	9.0	9.5	10.8	59.4	60.4	59.3
Chemistry	25.9	26.2	25.0	10.1	11.8	13.4	64.0	62.0	61.6
Physics	33.9	34.0	36.0	7.9	7.9	8.8	58.2	58.1	55.2
Other physical sciences	41.1	32.7	31.1	8.5	7.0	8.2	50.4	60.3	60.7
Social Sciences	30.5	29.8	28.5	7.5	8.3	10.7	62.0	61.9	60.8
Economics	36.6	35.8	34.9	4.9	4.2	5.7	58.5	60.0	59.4
Psychology	15.7	15.8	14.8	11.6	13.7	16.9	72.7	70.5	68.3
Sociology	31.9	33.2	30.6	4.6	6.5	9.4	63.5	60.3	60.0
Other social sciences	42.1	40.8	40.6	5.7	5.5	6.6	52.2	53.7	52.8
All Other Fields	21.0	22.2	19.7	4.2	4.3	6.1	74.8	73.5	74.2
Subtotal Science/Engineering	29.7	28.6	27.1	7.1	8.0	9.8	63.2	63.4	63.1

Appendix A

Survey Instrument

Production of Doctorates in Selected Fields, 1972-1975

FIELDS OF STUDY[2]	Doctorates Conferred[1]		
	Actual number of degrees	Estimated number of degrees	
	July 1971 to June 1972	July 1972 to June 1973	July 1974 to June 1975
Arts and Humanities	[ ]	[ ]	[ ]
Education	[ ]	[ ]	[ ]
Engineering	[ ]	[ ]	[ ]
Health Professions	[ ]	[ ]	[ ]
Law	[ ]	[ ]	[ ]
Life Sciences TOTAL	[ ]	[ ]	[ ]
Biology			
Biochemistry			
Microbiology			
Physiology			
Other Life sciences			
Mathematical Sciences	[ ]	[ ]	[ ]
Physical Sciences TOTAL	[ ]	[ ]	[ ]
Chemistry			
Physics			
Other physical sciences			
Social Sciences TOTAL	[ ]	[ ]	[ ]
Economics			
Psychology			
Sociology			
Other social sciences			
All Other Fields	[ ]	[ ]	[ ]
TOTAL	[ ]	[ ]	[ ]

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Appendix B

FIELDS OF STUDY

[1]Doctorate: The doctoral classification includes such degrees as the Ph.D.,Sc.D., D.P.H., and Ed.D. but excludes professional degrees such as the M.D., D.D.S., and D.V.M.

[2]Arts and Humanities: Include English, literature, foreign languages, history, architecture, fine and applied arts, philosophy, religion, etc.

Health Professions: Include nursing, hospital and health care administration, public health, pharmacy, and other allied health fields.

Other Life Sciences: Include other biological sciences such as botany, zoology, anatomy, entomology, etc., and other life sciences such as agriculture and forestry.

Mathematical Sciences: Include mathematics, statistics, computer sciences, data processing, systems analysis, and all related fields.

Other Physical Sciences: Include astronomy, atmospheric sciences and meteorology, geology, geophysics, metallurgy, oceanography, paleontology, pharmaceutical chemistry, etc.

Other Social Sciences: Include anthropology, archeology, geography, political science, government, and demography. History students should be reported in Arts and Humanities. Public affairs and services such as public administration, social work, and law enforcement, and other applied social sciences such as criminology, international relations, and urban studies, should be included in All Other Fields.

All Other Fields: Include all fields other than those indicated above, for example, area studies, communications, home economics, library science, public affairs and services, and applied social sciences.

Appendix C

Sampling and Weighting Procedures

The eligible population for this survey consisted of 314 Ph.D.-granting institutions (168 public institutions and 146 private institutions). Data on doctorate production levels were solicited from a sample of 219 institutions (69.7 percent of the eligible population). Returns were received from 209 institutions (95.4 percent). Of these, five institutions could not provide data for 1971-1972, ten could not provide data for 1972-1973, and fourteen could not provide data for 1974-1975. Consequently, the data presented for 1971-1972 are based on returns from 204 institutions, 1972-1973 on returns from 199 institutions, and 1974-1975 on returns from 195 institutions. Because of the differential response rate for the three time periods, data were weighted separately for each year to provide estimates of population figures and to increase the comparability of the data.

The population of 314 institutions was classified into the following strata:

Stratum I	Public universities
Stratum II	Private universities
Stratum III	Public four-year colleges
Stratum IV	Private four-year colleges
Stratum V	Public independent medical schools
Stratum VI	Private independent medical schools
Stratum VII	All seminaries

The doctoral production estimates reported in the sample by responding institutions were weighted to provide aggregate estimates of population figures. The aggregate estimator used was:

$$X'_r = \sum_{h=1}^{L} \frac{Z_h \sum_{i=1}^{n_h} W_h X_{hi}}{\sum_{i=1}^{n_h} W_h z_{hi}}$$

where W_h is a stratum weight, the ratio of the number of institutions in the population to that in the sample for the h^{th} stratum.

X_{hi} is the number of doctoral degrees conferred as reported by the i^{th} sample institution in the h^{th} stratum.

z_{hi} is the number of doctoral degrees conferred in the corresponding field (or field aggregate) as reported to HEGIS VI for the i^{th} sample institution in the h^{th} stratum.

Z_h is the total doctoral count in the corresponding field (or field aggregate) as reported to HEGIS VI for the h^{th} stratum.

L is the number of strata defining a reporting category.

The HEGIS data on doctoral degrees conferred was used to provide a ratio adjustment factor in these estimates. In the absence of data on doctoral production counts for later years, the HEGIS data for 1970-1971 were used in the computation of the ratio estimator for all three time periods. Note that separate ratio adjustments were made for each field estimate.

To estimate the precision of these estimators, the relative variance was computed as:

$$\sigma_{\bar{X}'_r}^2 = (X'_r)^2 \left(V_x^2 + V_z^2 - 2\rho_{xz} V_x V_z\right)$$

where V_x^2 is the estimated population relative variance of the doctoral production count, as reported by the sample institutions, V_z^2 is the estimated population relative variance of the doctoral production count as reported to HEGIS by the sample institutions, and the last term is twice the covariance between them. Each of these terms were separately estimated from the sample data within strata and combined across strata to estimate the population variance in the reporting category, which consisted in each case of one or more strata.

The 95 percent confidence limits appearing in Tables C2 and C3 were obtained by taking the square root of the absolute variance and multiplying it by 1.96. Thus, the total number of doctorates to be conferred during the period July 1974 to June 1975 in arts and humanities is estimated to be 5,818 with a 95 percent confidence interval of + or -227.

Table C1 reports for all institutions the number of institutions used to estimate each field of study for the sample and the population. Weights were subsequently obtained for each field of study by year, by stratum. The resulting range of weights developed for each field and year for the seven strata is also reported in Table C1.

Table C1

Sample and Weights Used in Computing National Doctorate Production Figures

All Institutions

Field of Study	Number of Institutions[a] in:				Stratum Weights (Range)		
	Population	Sample					
	1971-1972	1971-1972	1972-1973	1974-1975	1971-1972	1972-1973	1974-1975
Arts and Humanities	190	136	135	133	1.18-9.00	1.21-9.00	1.21-9.00
Education	147	121	120	119	1.15-1.56	1.19-1.50	1.19-1.45
Engineering	138	120	117	115	1.00-1.21	1.00-1.27	1.00-1.27
Health Professions	85	65	59	60	1.00-2.00	1.00-2.00	1.00-2.00
Life Sciences	194	148	149	146	1.18-1.67	1.14-1.67	1.20-1.67
Biology	100	86	89	85	1.00-1.33	1.00-1.33	1.00-1.33
Biochemistry	115	88	81	85	1.14-1.67	1.19-2.00	1.18-1.67
Microbiology	112	81	79	75	1.18-3.00	1.19-3.00	1.19-2.00
Physiology	100	74	72	69	1.19-2.00	1.20-1.67	1.24-2.00
Other life sciences	160	121	119	119	1.20-1.67	1.20-1.67	1.17-1.67
Mathematical Sciences	143	123	118	119	1.00-1.33	1.00-1.29	1.08-1.25
Physical Sciences	193	158	158	154	1.13-1.25	1.12-1.26	1.21-1.30
Chemistry	176	152	151	148	1.07-1.20	1.07-1.20	1.15-1.23
Physics	145	126	130	127	1.00-1.25	1.00-1.20	1.17-1.23
Other physical sciences	122	96	94	92	1.13-1.67	1.13-1.50	1.11-1.50
Social Sciences	172	142	140	140	1.18-1.25	1.20-1.25	1.00-1.38
Economics	109	91	91	89	1.00-1.50	1.00-1.50	1.00-1.50
Psychology	153	126	128	127	1.17-1.22	1.17-1.25	1.00-1.38
Sociology	94	80	76	85	1.00-1.22	1.00-1.28	1.00-1.29
Other social sciences	115	101	95	98	1.00-1.16	1.00-1.21	1.00-1.26
All Other Fields	121	102	102	99	1.00-1.40	1.00-1.27	1.00-1.50

[a]Indicates the number of institutions offering doctorate degrees in each field of study.

Table C2

Estimated Sampling Error[1] in Population Estimates by Field of Study and Academic Year for:

All Institutions[2]
Public Institutions[3]
Private Institutions[4]

Field of Study	All Institutions			Public Institutions			Private Institutions		
	Confidence Interval			Confidence Interval			Confidence Interval		
	1971-72	1972-73	1974-75	1971-72	1972-73	1974-75	1971-72	1972-73	1974-75
Arts and Humanities	156	346	227	81	77	93	134	338	207
Education	273	307	317	261	283	289	80	119	129
Engineering	87	104	123	71	89	100	51	55	72
Health Professions	137	153	178	136	150	175	18	28	31
Life Sciences	203	241	275	173	216	254	106	108	107
Biology	41	43	54	36	37	49	20	22	22
Biochemistry	42	55	58	39	52	54	16	17	22
Microbiology	40	50	52	38	47	50	15	16	16
Physiology	33	36	40	31	33	37	12	15	15
Other life sciences	178	222	243	142	188	216	107	118	112
Mathematical Sciences	51	52	61	40	42	51	33	31	34
Physical Sciences	101	146	172	79	118	147	63	85	89
Chemistry	52	68	78	44	56	67	29	39	40
Physics	49	58	66	43	51	58	23	29	32
Other physical sciences	75	77	93	64	58	73	39	51	58
Social Sciences	142	156	202	111	125	176	89	93	98
Economics	61	66	79	50	57	72	35	34	34
Psychology	69	71	94	60	59	82	35	40	45
Sociology	33	37	41	30	34	38	13	14	15
Other social sciences	87	96	105	66	70	81	56	66	66
All Other Fields	128	141	163	86	103	125	95	96	104

[1] 95 percent confidence interval (interpreted as + or -)

[2] Based on Table 2

[3] Based on Table 3

[4] Based on Table 4

Table C3

Estimated Sampling Error[1] in Population Estimates by Field of Study and Academic Year for:

"Top Twenty" Institutions [2]
"Developing" Institutions [3]
All Other Institutions [4]

Field of Study	Top Twenty Institutions			Developing Institutions			All Other Institutions		
	Confidence Interval			Confidence Interval			Confidence Interval		
	1971-72	1972-73	1974-75	1971-72	1972-73	1974-75	1971-72	1972-73	1974-75
Arts and Humanities	59	91	81	10	16	9	138	335	211
Education	26	72	57	17	26	-	250	278	296
Engineering	46	73	68	13	18	21	72	78	99
Health Professions	-	32	43	-	2	12	117	135	167
Life Sciences	112	155	155	34	33	40	162	200	231
Biology	11	13	14	9	-	-	34	37	48
Biochemistry	-	12	9	-	-	-	35	45	51
Microbiology	-	12	12	-	-	-	38	42	42
Physiology	-	7	-	-	-	-	25	26	26
Other life sciences	117	163	158	7	7	8	146	185	214
Mathematical Sciences	33	31	33	8	12	5	39	42	48
Physical Sciences	52	103	91	34	30	38	81	121	149
Chemistry	18	39	31	14	16	20	48	57	67
Physics	24	44	43	34	-	5	37	43	51
Other physical sciences	44	56	55	-	2	2	48	55	74
Social Sciences	29	51	50	8	10	11	114	130	188
Economics	21	35	33	-	-	-	43	48	63
Psychology	18	30	26	-	-	-	56	57	85
Sociology	-	12	10	-	-	-	29	30	33
Other social sciences	27	58	56	-	-	-	59	65	74
All Other Fields	50	82	76	-	-	-	102	109	137

[1] 95 percent confidence interval (interpreted as + or -). Dashes are shown when computed figures equaled less than 0.5.

[2] Based on Table 7

[3] Based on Table 8

[4] Based on Table 9